Design Guidelines for Flood-Based Farming Systems

Proposal for publication through ICID, WG-DROUGHT

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What are Flood-based Farming Systems (FBFS)?

- Reversing the destructive nature of floods into blessing for multiple use:
  - Increased cropped area: cereals, oil seeds, pulses, fruit trees
  - Better groundwater recharge
  - Forest and rangeland support
  - Domestic and livestock water supply
  - Rehabilitation of degraded environments
  - Balance with ecological functions
Why are we interested in FBFS?

- They constitute poverty pockets – they are central to our effort to lift 700 million people out of poverty
- They are significant: 15 Million ha in arid and semi-arid regions in SSA
- They are quintessential adaptation to extended drought and occasional floods – climate variability and change
- They contribute to environmental sustainability
- They are orphans left-out between rain-fed and convention irrigated Agriculture
Fogera Floodplain, Flood recession, Ethiopia
Introducing shalllow wells

Sophisticated diversion in Yemen – 20,000 ha – built in 1978 – still operation, but with many difficulties
Innovations in Flood water management - Pakistan

Main innovation: combination of gabion and masonry: maintaining safety at a lower cost. Gabion cost is about one fifth of masonry.
FULACHI / NIGER (slide by Nill, GIZ)
Rehabilite degraded land, improve groundwater recharge and productivity

NIGER: FLOOD WATER SPREADING WEIR = ROAD
Innovations in flood water management – invest in the command area - Pakistan

Low recharge weir to slow down and spread floods (Yemen)
Pipe off-take at Tirke spate irrigation scheme before and after it was filled with sediment

Open off-take - Dayu Scheme:
3 m wide, 120°
Design capacity: 380 ha
Actually irrigated: 200 ha

Incremental research - evolution of small scale flood-based irrigation design in Tigray, Ethiopia

2002 and before
Closed conduit gate (1 m); 90°
+ Design capacity: 400 ha
+ Actual capacity: 0 ha

2005
Closed rectangular gate (1 m); 90°
+ Design Capacity: 400 ha
+ Actual capacity: 0 ha

2008 to 2010
Open gate (3 m); 120°
+ Design capacity: 500 ha
+ Actual capacity: 300 ha

Now (2014)
Open gate (5 m); 120° and 150°
+ 500 ha – under construction with funding from PASIDIP(IFAD)
Soil Moisture Conservation - Innovation

Spate Irrigation course in five higher education institutions

- **Yemen:** Sana’a University, Yemen: Water and Environment Centre
- **Ethiopia:** Mekelle University, Ethiopia: Institute of Water and Environment
- **Pakistan:** PMAS Arid Agriculture University Rawalpindi Gomal Zam University, di khan
- **Sudan:** Universities of Gezira and Khartoum: Draft course ready, official procedures under way
- **Netherlands:** Short course at UNESCO-IHE Institute for Water Education
There is a need for new generation of water professionals

With the capacity to go beyond the standard design approaches of conventional irrigation that has failed to:

- Appropriately take into account the level of uncertainty related to floods,
- the hydraulic challenge of guiding flood flows, the heavy sediment loads,
- the exceptional nature of the water rights, or the management and maintenance needs.

Publication: Design Guidelines on Flood-based Farming Systems - Status

- **August, 2013**: Funding secured from IFAD and DUPC
- **28 to 31, 2013**: Planning meeting in Ethiopia among the main implementing partners - UNESCO-IHE, MeMeta, Mekelle University, Ethiopia; Hydraulic Research Centre, Sudan - under the leadership of Professor Bart Schultz:
  - Unanimously agreed to publish the Guidelines through ICID, WG-Drought
  - Draft table of contents – chapters and major sub-topics - finalized
  - Responsibilities assigned to finalize draft chapters by December, 2014-
- **18 September, 2014**: 7 of the 11 draft chapters received
# Table of Content: Main Chapters and Sub-topics

**Chapter 1: Introduction** *(draft ready)*

**Chapter 2: Background and Rationale**

**Chapter 3: Flood based irrigation systems** *(draft ready)*
- Definition
- Types and characteristics
- Status and potential
- Design challenges

**Chapter 4: Hydrology and water resources analysis** *(draft ready)*
- Catchment characteristics
- Flood analysis (rainfall analyses included)
- Groundwater potential
- River morphology and sediment analyses

**Chapter 5: Design of water diversion** *(draft ready)*
- Design strategy/consideration (command area included)
- Geotechnical investigation
- Sediment management
- Hydraulic design
- Structural design

**Chapter 6: Design of water conveyance and distribution systems** *(draft ready)*
- Design strategy/consideration
- Canal design (layout, profiles, distribution structures, materials ..)

**Chapter 7: Design of on-farm water managements systems**
- Soils (including soil moisture management)
- Agronomy
- Field water management (water rights and scheduling, water distribution, field structures and practices, drainage techniques, conjunctive water use)
Table of Content: Main Chapters and Sub-topics

Chapter 8: Operation and maintenance *(Draft ready)*
- O&M requirements
- Sediment management
- Time response (including early warning)
- Types of maintenances
- Monitoring and evaluation

Chapter 9: Institutional aspects
- Types of institutions
- Communication mechanisms
- Roles and responsibilities of stakeholders
  - At Design and Construction
  - At O&M stage
- Social issues (potential conflicts and conflict mitigation, livelihood strategies, legislation,